CLAIMS

1. A composition comprising:
a ladder polymer or oligomer comprising an iptycene.

2. A composition comprising an iptycene, having a molecular weight in excess of 2000 daltons, comprising a shape persistent molecule containing bridgehead atoms, with molecular structures radiating from the bridgehead atoms in three directions and extending outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 3.5 Å.

3. A composition as in claim 2, comprising a linear polymer comprising an iptycene.

4. A composition as in claim 2, arranged as a dielectric material in an electronic component.

5. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 4.0 Å.

6. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 4.5 Å.

7. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 5.0 Å.

8. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 5.5 Å.

9. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 6.0 Å.

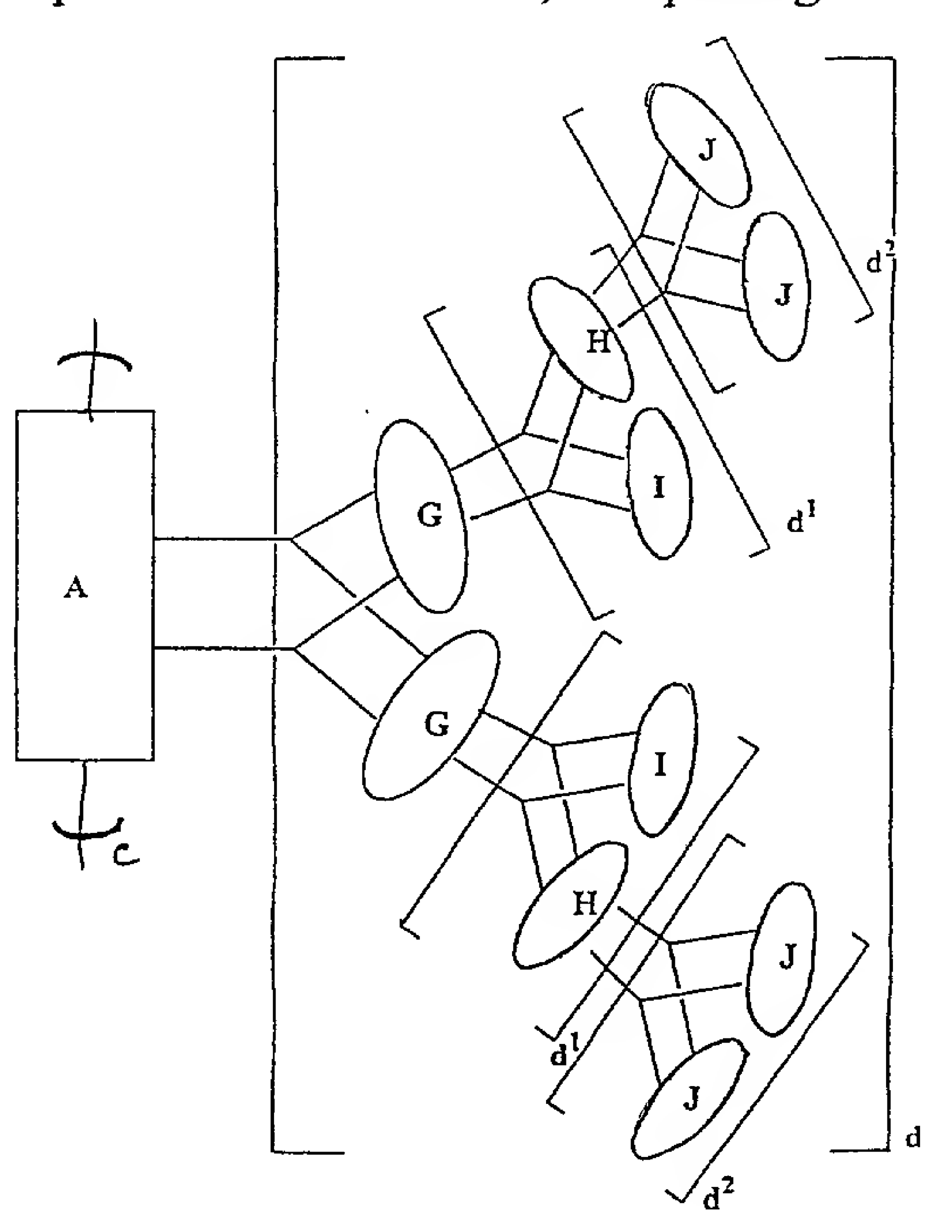
10. A composition as in claim 2, wherein the molecular structures that radiate from the bridgehead atoms extend outwardly therefrom such that each defines a van der Waals contact of furthest point from the bridgehead atoms of no less than 6.2 Å.

11. A composition as in claim 1, having a lowest energy state in which the polymer has a backbone the contains a plane.

12. A composition as in claim 11, including a plurality of aromatic rings that each align normal to the plane in the lowest energy state, and the polymer has a minimum dimension, measured as van der Waals contact dimensions, of 6.0 Å.

13. A composition as in claim 1, the polymer including a backbone comprising backbone atoms bonded to other backbone atoms, wherein bonds involving the backbone atoms are not freely rotatable.

14. A composition as in claim 1, comprising a structure:



15. A composition as in claim 2, wherein the bridgehead atoms comprise carbon or nitrogen.

16. A composition as in claim 1 where in the backbone is composed of triptycene units.

17. A composition as in claim 2 comprising a branched structure.

18. A composition as in claim 2 comprising a hyperbranched structure.

19. A composition as in claim 18, comprising polymer chain units comprising chemical functionality allowing formation of grafts.

20. A composition as in claim 18, comprising a grafted polymer including non-iptycene units grafted onto polymer chain units.

21. A composition as in claim 18, comprising a grafted polymer including iptycene units grafted onto polymer chain units.

22. A composition as in claim 18, comprising a polymer of monomer units each including two reactive sites, one of which has reacted with another monomer unit to form the polymer backbone, and another of which is available for grafting after formation of the polymer.

23. A composition as in claim 1 comprising a dendritic structure.

24. A composition as in claim 1 wherein the polymer has cyclic sub-units.

25. A composition as in claim 1 which, in a solid state, has at least 30% free volume and a dielectric constant of about 1.9 or less.

26. A composition as in claim 1 which, in a solid state, has at least 50% free volume and a dielectric constant of about 1.7 or less.

27. A composition as in claim 1 which, in a solid state, has at least 70% free volume and a dielectric constant of about 1.5 or less.

28. A composition as in claim 1 which, in a solid state, has at least 90% free volume and a dielectric constant of about 1.2 or less.

29. A composition as in claim 2 wherein the polymer has a backbone defined by non-iptycene units, and comprises iptycene units connected to the backbone.

30. A composition as in claim 1, comprising a first porous polymeric component and further comprising a second polymeric component forming an interpenetrating network permeating the pores of the first porous polymeric component.

31. A composition comprising a first component comprising a first, porous, shape persistent polymeric component and a second polymeric component forming an interpenetrating network permeating the pores of the first polymeric component.

32. A composition as in claim 32 wherein the second component is an elastomer.

33. A composition as in claim 32 wherein the second component is a conjugated polymer.

34. A composition as in claim 32 wherein the material shows a negative Poisson's ratio when elongated.

35. A composition comprising:

a chromophore;

a shape-persistent molecule having at least 20% free volume; and

a host material within which the shape-persistent molecule self-orients.

36. A composition as in claim 35, where the shape-persistent molecule includes at least two aromatic rings, each parallel to a common axis in a lowest energy state of the composition.

37. A composition as in claim 35, wherein the chromophore is bonded to the shape-persistent molecule.

38. A composition as in claim 35, wherein the chromophore is a fluorescent entity.

39. A composition as in claim 35, further comprising a liquid crystalline species.

40. A composition as in claim 39, comprising:

a plurality of liquid crystalline species, each having a primary axis aligned so as to together define an average axis of the liquid crystalline species primary axes; and

a plurality of chromophores each having a primary axis aligned so as to together define an average axis of the chromophore primary axes,

wherein the alignment of the individual chromophores relative to the average axis of the chromophore primary axes includes less variation than the alignment of the individual liquid crystalline species relative to the average axis of the liquid crystalline species primary axes.

41. An article defining a size-exclusion article, comprising a composition as in claim 1.

42. An article comprising an electrode, and a composition as in claim 1 associated with the electrode.

43. A composition comprising a first component as in claim 1 and a second component that has a high molecular weight linear polymer such that the composition has superior strength compared to a composition that lacks the first component.

44. A composition as in claim 43 wherein the first component comprises an iptycene.

45. A composition as in claim 35, comprising polymerizable groups.

46. A composition as in claim 35, wherein the chromophore is a liquid crystal.

47. A composition as in claim 35, wherein the host material comprises a plurality of liquid crystalline species, each having a primary axis aligned so as to together define an average axis of the liquid crystalline species primary axes, wherein the chromophore has a transition moment that is essentially parallel to the average axis of the liquid crystalline species primary axes.

48. A composition as in claim 35, wherein the host material comprises a plurality of liquid crystalline species, each having a primary axis aligned so as to together define an average axis of the liquid crystalline species primary axes, wherein the chromophore has a transition moment that is essentially perpendicular to the average axis of the liquid crystalline species primary axes.

49. A composition as in claim 35, further comprising a plurality of liquid crystalline species, wherein the chromophore self-orients relative to the liquid crystalline species.

50. A molecule as in claim 35 wherein the dichroic molecule exhibits a greater order parameter than the liquid crystal host.

51. A molecule as in claim 35 wherein the dichroic molecule is fluorescent.

52. A molecule as in claim 35 wherein first component is an iptycene.

53. A device comprising:

a chromophore comprising an iptycene, the device constructed and arranged to be capable of moving the chromophore from a first orientation to a second orientation upon application to the chromophore of a source of external energy.

54. A device as in claim 53, wherein the source of external energy is an electric, magnetic, optical, acoustic, electromagnetic, or mechanical field.

55. A device as in claim 53, wherein the device is constructed and arranged to change the polarization of the chromophore's optical, magnetic, or dielectric absorptions upon application of the external energy source.

56. A device as in claim 53, constructed and arranged to display a change in color upon application of the external energy source.

57. A device as in claim 53, constructed and arranged to display a change in luminescence upon application of the external energy source.

58. A device as in claim 53, constructed and arranged to display a change in transmission of an optical signal upon application of the external energy source.

59. A device as in claim 53, wherein the chromophore bonded to the iptycene can be switched from a first low-energy, stable orientation to a second, low-energy, stable orientation upon application of the external energy source.

60. A device as in claim 53, constructed and arranged to impart polymerization to the iptycene upon application of the external energy source.

61. A device as in claim 53, constructed and arranged to display a signal recognizable to a human upon application of the external energy source.

62. A device as in claim 61, wherein the signal is a hologram.

63. A device as in claim 53, wherein application of the external energy source causes switching in a liquid crystal display.